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Farnell

M SERIES
POWER SUPPLIES

INSTRUCTION BOOK

INSTRUCTION BOOK FOR

M SERIES
POWER SUPPLIES

FARNELL INSTRUMENTS LIMITED • SANDBECK WAY • WETHERBY LS22 4DH • YORKSHIRE • ENGLAND. TELEPHONE 0937 3541-6

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SCHEDULE OF EQUIPMENT

The instrument has been carefully packed to prevent damage in transit. When removing the unit from the box, be sure to remove all parts and accessories from the packing material.

The complete equipment comprises:-

a) 1 off M series power supply

b) 1 off Instruction book

c) 1 off Plastic cover for terminal complete with 2 nuts and 2 washers

Optional accessories

a) 1 off Metal mesh cover

b) 1 off Overvoltage crowbar unit type MC (models MW1 and MX2 only)

Note:- In the event of damage in transit or shortage in delivery separate notices in writing should be given to both the carriers and Farnell Instruments Ltd., within three days of receipt of the goods, followed by a complete claim within five days. All goods which are the subject of any claim for damage in transit or shortage in delivery should be preserved intact as delivered, for a period of seven days after making the claim, pending inspection or instructions from Farnell Instruments Ltd., or an agent of this Company.

INTRODUCTION

The M series power supplies are low cost, compact units ideal for incorporating into original equipment.

The MW and MX models have fully variable d.c. outputs adjustable by coarse and fine potentiometers with full current available at any point in the adjustment range. Models MY and MZ have nominal 5V outputs adjustable by a single control over the range 5-6V.

Overload and short circuit protection is provided by current limiting circuitry which has an approximately constant current characteristic and automatically resets on removal of the overload condition. An add-on crowbar unit type MC will protect integrated circuits from an overvoltage. This optional device may be used with models MW1 and MX2 and bolts onto the unit's terminal block. Models MY2 and MZ4 have built-in overvoltage protection. It is necessary to momentarily interrupt the mains supply to reset the overvoltage crowbar circuit after it has fired.

Units available

Model	Output	
	Voltage (d.c.)	Current
MW05	15 - 30V	0.5A
MW1	5 - 15V	1A
MX1	15 - 30V	1A
MX2	5 - 15V	2A
MY2	5 - 6V	2A
MZ4	5 - 6V	4A

SPECIFICATION

MAINS INPUT	A.C. mains 220, 240V 50-400Hz (110, 115V to special order)
MAINS VARIATION TOLERATED	±10%
LINE REGULATION Output change for a ±10% mains change	Less than 3mV
LOAD REGULATION Output change for a zero to full load change	Less than 15mV (25mV for MZ4)
RIPPLE AND NOISE at full load (Δf = 80kHz)	Less than 1mV r.m.s.
TRANSIENT RECOVERY TIME, typical	Less than 300μS for output to recover within 50mV following a full load change for 1μS rise time
OUTPUT IMPEDANCE, typical	Less than 0.1Ω at 1kHz and 25°C
TEMPERATURE COEFFICIENT, typical	0.02% per °C
OPERATING AMBIENT TEMPERATURE RANGE	0°C to +60°C
STORAGE TEMPERATURE RANGE	-40°C to +85°C

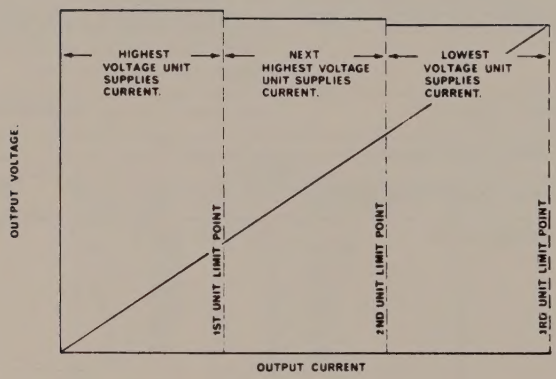

HIGHEST VOLTAGE UNIT SUPPLIES CURRENT.
NEXT HIGHEST VOLTAGE UNIT SUPPLIES CURRENT.
LOWEST VOLTAGE UNIT SUPPLIES CURRENT.
OUTPUT VOLTAGE.
1ST UNIT LIMIT POINT
2ND UNIT LIMIT POINT
3RD UNIT LIMIT POINT
OUTPUT CURRENT

Fig. 1 - Parallel operation, output characteristic.

OPERATING INSTRUCTIONS

Installation

Check that the unit supplied is suitable for the local mains supply.

Connection to the mains is made via the terminal block on the front panel of the unit. The live lead (brown) should be connected to the terminal marked 'L'. The neutral lead (blue) should be connected to the terminal marked '220' or '240' ('110' or '115' on alternative units) according to the local mains supply. The earth lead (yellow/green) should be connected to the 'E' terminal.

D.C. output is taken from the terminals on the front panel marked 'O/P+' and 'O/P-'. The output voltage should be trimmed to that required before connecting it to the load. Adjustment is by coarse (P1) and fine (P2) controls in the case of the MW and MX models. A single control (P2) provides the smaller adjustment range of the MY and MZ units.

The unit is intended for use in an environment where ambient temperatures are between $0^{o}C$ and $+60^{o}C$. The units may be mounted in any plane other than on the heatsink/regulator face. When mounting on a flat surface, an adequate cut-out area should be provided beneath the unit for ventilation. Alternatively the unit should be mounted on spacers to raise it a little above the flat plane.

Series operation

Units may be connected in series to provide higher voltage output, but diodes capable of carrying the full load current must be connected across each output in such a manner as to reverse bias them under normal operating conditions (i.e. cathode to positive output terminal).

Parallel operation

Units set to approximately the same output voltage may be connected directly in parallel. On increasing load the unit having the highest output voltage will carry the load until it current limits, thereafter the unit having the next highest voltage will supply the extra current until it limits, and so on. A typical output characteristic is shown in fig. 1. The characteristic shows a series of descending steps in output voltage at the current limit points of individual units. The amplitude of the step depends on how closely the output voltages have been set, and it may not be possible to adjust this to better than 50mV.

It is recommended that not more than three units are connected in parallel.

CIRCUIT DESCRIPTION

The circuit employs a series regulator transistor driven via an emitter follower from a differential amplifier which compares the voltage of a zener diode reference with a proportion of the output voltage derived from a resistive potential divider.

The mains supply is connected to transformer MT1 via fuse F1. The main secondary winding supplies a bridge rectifier/reservoir capacitor system, which provides the main unregulated d.c. line. The positive line is connected via the series regulator transistor to the positive output terminal. The negative line is connected to the negative output terminal (via fuse F2 on all models except MWO5 and MW1).

Supplies for the amplifier and reference system are derived from the auxiliary 28 volt secondary winding via rectifier diodes D5 and D6, and smoothed by capacitor C1. The unstabilized reference line across C1 is fed to the zener diode stabilizing network R1, Z1, R2, Z2, which provides a +10, 0, -5V supply for the differential amplifier. R3 supplies current to the main reference zener diode Z3 and potential divider chain R4, P1 (except MY and MZ models) and P2.

The base of VT2 and negative of Z3 are connected to the positive output terminal. Z3 therefore gives a voltage positive with respect to the positive output line. R4 is connected between the positive of Z3 and VT1 base. Signal voltage between VT1 and VT2 bases is amplified at the collectors of VT2 and VT3, VT3 being a high impedance collector load whose dynamic impedance is varied by VT1. The signal is then applied via R7 and the emitter follower VT5 to the series regulator VT6 in such sense as to oppose the original signal at VT1 and VT2 bases. The action of the loop is therefore to maintain zero signal between VT1 and VT2 bases. Output voltage is determined by:-

$$\frac{Vref.\ (P1^{*} + P2 + R14)}{R4} \qquad (^{*}P1 \text{ absent for MY and MZ})$$

Overload protection is provided by VT4 the base of which is connected to potential divider R8 and R17 between the series regulator base and the output terminal.

When output current is low VT4 is non-conducting since the voltage at its base is negative with respect to the positive output. As output current increases, the voltage across R9 increases and the junction of R8 and R17 becomes more positive, causing VT4 base to become more positive. With increasing load this process continues until VT4 starts to conduct. This diverts some of the drive current from VT5 base and the output voltage starts to fall.

As the output voltage falls, the negative output terminal becomes more positive with respect to the positive one, and hence the base of VT4 becomes more positive since current through R17 is reducing. This drives VT4 further into conduction and reduces the output current. Thus with increasing overload the output voltage and current fall until at short circuit the output current is defined by the value of R10. On 6 and 15V units the action is the same until the unit output voltage falls to 5V on overload. At this point D7 begins to conduct thus reducing the voltage of the negative 5V auxiliary rail and reducing the overload V/I characteristic.

MAINTENANCE

Guarantee

The equipment supplied by Farnell Instruments Ltd., is guaranteed against defective material and faulty manufacture for a period of twelve months from the date of despatch. In the case of material or components employed in the equipment but not manufactured by us, we allow the customer the period of any guarantee extended to us.

The equipment has been carefully inspected and submitted to comprehensive tests at the factory prior to despatch. If, within the guarantee period, any defect is discovered in the equipment in respect of material or workmanship and reasonably within our control, we undertake to make good the defect at our own expense subject to our standard conditions of sale. In exceptional circumstances and at the discretion of the Service Manager, a charge for labour and carriage costs incurred may be made.

Our responsibility is in all cases limited to the cost of making good the defect in the equipment itself. The guarantee does not extend to third parties, nor does it apply to defects caused by abnormal conditions of working, accident, misuse, neglect or wear and tear.

Maintenance

In the event of difficulty, or apparent circuit malfunction, it is advisable to telephone (or telex) the Service Department or your local Sales Engineer or Agent (if overseas) for advice before attempting repairs.

For repairs and recalibration it is recommended that the complete instrument be returned to:-

The Service Department
Farnell Instruments Ltd.,
Sandbeck Way,
Wetherby, Yorkshire.
LS22 4DH
Tel: 0937 3541

or

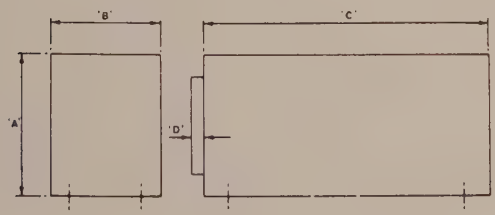
Service Depot,
Farnell Instruments Ltd.,
Hermitage Road,
London N4.

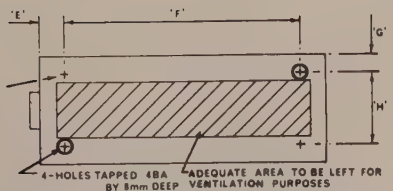
Tel: 01-802-5359

Please ensure adequate care is taken with packing and arrange insurance cover against transit damage or loss.

MECHANICAL DETAILS

Model	Output		Dimensions (mm)								Weight kg
	Voltage	Current	A	B	C	D	E	F	G	H	
MW05	15—30V	0·5A	76·5	61·5	131·5	10	16·5	98	6·5	48·5	1·13
MW1	5—15V	1A	76·5	61·5	131·5	10	16·5	98	6·5	48·5	1·13
MX1	15—30V	1A	91·5	87	178·5	10	24·5	132	7·5	72	2·04
MX2	5—15V	2A	91·5	87	178·5	10	24·5	132	7·5	72	2·04
MY2	5V	2A	76·5	71·5	155·0	10	28·5	98	6·5	58·5	1·4
MZ4	5V	4A	91·5	97	212·0	10	40·0	132	7·5	82	2·85





⊕ These holes are absent on MY and MZ models
Remaining 2 holes are tapped 4M x 8MM deep

ERRATA & ADDENDUM

Alternative components to those listed on the circuit diagram may be used in the event of supply difficulties.

Major design changes are listed below:-

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